

Amendments to the Drawings:

In FIG. 8, on line 6 of the Percentages column, “NP” has been changed to --LP--.

Please replace all drawing sheets currently in the application with the attached replacement sheets of formal drawings. The attached replacement sheet for FIG. 8 includes the change to that figure.

Attachments: Annotated Sheet (FIG. 8)

Replacement Sheets (FIGS. 1-13)

REMARKS

Claims 1-3, 12, 21 and 22 remain pending in the present application. Favorable reconsideration of the present application is respectfully requested in view of the amendments set forth above and the below remarks.

FIG. 8 has been amended to replace “NP” with --LP-- (in ‘Percentages’ column, sixth line) to correct a typographical error in the figure as originally filed. It will be seen that this change makes the information on line 6 of the ‘Percentages’ column consistent with the information in the corresponding line of the ‘Classes Pending’ column of the table shown in FIG. 8. A replacement sheet incorporating the change and an annotated sheet showing the change are attached hereto.

In response to the requirement for corrected drawings, a set of formal drawings is attached hereto. The formal drawings (replacement sheets) correct the informalities in the originally filed informal drawings and include the replacement sheet for the amended FIG. 8.

Also submitted with this response is a Terminal Disclaimer effective to overcome the obviousness-type double patenting rejection as between the present application and prior U.S. Patent No. 6,754,897.

Claims 1, 2, 12, 21 and 22 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,381,546, in the name of Servi et al. (“Servi”) in view of U.S. Patent No. 6,145,028, in the name of Shank (“Shank”). Claims 1, 2, 12, 21 and 22 have been amended to define with greater clarity that which is regarded as the Applicants’ invention. More specifically, the “lookup” in the claims now requires the use of a table “configured according to predetermined probability settings.” Support for this change can be found throughout the specification (of the present application), for example, at page 9, lines 27-30, page 15, lines 6-24, page 18, lines 4-22 as well as at the bottom of page 19, lines 24-30, through the top of page 20, lines 1-15. FIGS. 8, 10, 11 and 12 show exemplary probability settings by which tables can be configured. For example, FIG. 10 shows an example of probability settings for configuring an operations scheduling table for high priority (“HP”) class operations. FIG. 9 shows such a table.

Independent method claim 1 recites a method of scheduling operations for logical volumes in a data storage system. The method includes, in part, “....selecting one of the

operations by performing a probability-based operations lookup...wherein the probability-based operations lookup comprises using at least one table configured according to predetermined probability settings.”

Servi neither teaches nor suggests an operations scheduling method as set forth in claim 1, in particular, a method that specifically relates to operations requested for a logical volume and requires a probability-based operations lookup that comprises using at least one table configured according to predetermined probability settings. Instead, Servi describes a queue based scheduling process (illustrated in FIG. 4, steps 41-48) for scheduling different types of task requests. Each type of task request is associated with a queue and assigned a probability parameter (“ p_i ”) indicative of a priority. Each probability parameter, a numerical value between 0 and 1, reflects a relative priority of the corresponding task request type. Col. 6, lines 11-20. During scheduling, the process cycles through the set of queues in a sequential order (order of priority) to select tasks. More specifically, the process selects the next available task from a given queue (if nonempty) and uses probability based on a randomly generated number to determine if the process should again select the next available task from that queue (if nonempty) or proceed to the next queue. It repeats these steps until all of the queues have been serviced. Col. 7, lines 8-18; Col. 7, lines 53-68, Col. 8, lines 1-2 (describing the process as depicted in FIG. 4); see also Col. 7, lines 22-36 regarding the randomly generated number used to select between one of two probabilities, p_i and $1-p_i$.

Thus, the selection of a requested task (i.e., operation) in Servi can involve probability at two different points in the scheduling process: i) when selecting a queue (as each queue has a pre-assigned priority in the form of a probability parameter and the process serves the queues in sequential/priority order); and ii) when determining whether to continue to select a next task from the current queue or move to the next queue (based on the randomly generated number and probability parameter, as discussed earlier). Neither of these activities involves a probability-based lookup that uses at least one table configured according to predetermined probability settings, but instead a selection of a queue and a task (“the next task”) within that queue. Therefore, in the selection of task requests no probability based lookup involving a table, in particular, a table configured according to predetermined probability settings, is performed.

Nor does Shank overcome the noted shortcomings in Servi. Shank is relied on for teaching logical volumes. However, Shank (like Servi) fails to teach or suggest the type of probability-based operations lookup set forth in claim 1. It should be pointed out that Shank does describe several table lookups, a switch table lookup (Col. 6, lines 43-57) and a path table lookup (Col. 6, lines 16-23), but neither involves probability or even operation selection. Since the probability-based operations lookup of claim 1 is lacking in the cited art, that is, Servi and Shank, whether taken separately or in combination, claim 1 is believed to be patentable over the cited art.

Independent apparatus claim 12 is similar to claim 1. Independent claim 21, directed to a data storage system, also is similar to claim 1. Thus, claims 12 and 21 are believed to be patentable for at least the reasons given above with respect to claim 1.

Independent method claim 22 is directed to a method of scheduling requested operations for a logical volume in a data storage system. The method includes, in part, “....selecting one of the plurality of priority classes by performing a first probability-based lookup, selecting one of the requested operations for scheduling by performing a second probability-based lookup....” Claim 22 therefore requires not just one but two probability-based lookups, a first to select a priority class and a second to select an operation. As amended, claim 22 also requires that each of the probability-based lookups use a table configured according to predetermined probability settings.

The arguments made with respect to claim 1 are applicable to claim 22 as well. Moreover, the cited references, whether taken alone or in combination, neither teach nor suggest two probability-based lookups, one for priority selection and one for operation selection, each using a table configured according to predetermined priority settings.

Dependent claim 2 depends from claim 1 and further limits claim 1. Thus, claim 2 is believed to be patentable for at least the reasons given above with respect to claim 1. Dependent claim 2 is further patentable over the cited references since neither Servi nor Shank, whether taken separately or in combination, describes or suggests the method of claim 2 wherein the at least one table comprises a table of entries corresponding to different operations, further comprising forming a plurality of first selection values, one corresponding to each of the priority classes in the plurality of priority classes, based on the determination,

selecting one of the priority classes in the plurality of priority classes based on the determination, and selecting a corresponding one of the plurality of first selection values corresponding to the selected one of the plurality of priority classes as a lookup index pointing to one of the entries.

Applicants acknowledge that dependent claim 3 would be allowable if re-written in independent form to include all of the limitations of base claim 1 and intervening claim 2. Claim 3 has been so amended.

The Examiner is respectfully invited to telephone the undersigning attorney if there are any questions regarding this Amendment or this application.

Applicants do not acquiesce to any assertion made by the Examiner that is not specifically addressed herein.

The Assistant Commissioner is hereby authorized to charge payment of any additional fees associated with this communication or credit any overpayment to Deposit Account No. 500845.

Respectfully submitted,

Dated: March 6, 2008

DALY, CROWLEY, MOFFORD & DURKEE, LLP

By: Cathy L. Peterson
Cathy L. Peterson
Reg. No. 41,249
Attorney for Applicant(s)
354A Turnpike Street - Suite 301A
Canton, MA 02021-2714
Tel.: (781) 401-9988, Ext. 125
Fax: (781) 401-9966

clp@dc-m.com

Appendix:

An Annotated Sheet for FIG. 8 and Replacement Sheets for FIGS. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 13 (12 sheets) are attached.

69712

Classes Pending	Percentages
None	100% None
HP	100% HP
NP	100% NP
HP and NP	80% HP, 20% NP
LP	100% LP
HP and LP	95% HP, 5% NP LP
NP and LP	75% NP, 25% LP
HP, NP and LP	75% HP, 20% NP, 5% LP

FIG. 8